anatomical characters of the Hamamelidaceæ, examined with the object of using them as a basis for the systematic arrangement of the family, by A. Reinsch (1 plate).—A list of the Polypodiaceæ, Gramineæ, Cyperaceæ, and Juncaceæ, collected by Dr. Marloth in South Africa.—On *Cassine domingensis* Spr., by A. Garcke.—A treatise on the genus Platanus, with two plates, by J. Jankó. This paper has special reference to the detail characters of the leaf.—On two *Soldanellas* new to the flora of Hungary, by V. A. Richter.—At the end of the volume are abstracts of many recent memoirs published elsewhere, and a classified list of the most important works on systematic, geographical, and descriptive botany published in the year 1889.

Bulletin de la Société des Naturalistes de Moscou, 1889, No. 2.—On the origin of periodical comets, by Th. Bredichin (in French). The author examines into the cases of division of comets into two or more individuals, endeavouring to classify the better known ones into "families," and gives the formulæ for the cases when the impetus given to the corpuscles of a comet acted under a given angle to the plane of its motion.—Note on the genus *Bombus*, by General Radoszkowski (in French).—The Amphibian fauna of Europe: the *Anura*, by Dr. J. Bedriaga, being a full description (in German) of the two genera *Rana* and *Bufo*, their species, varieties, life, and geographical distribution.

No. 3.—On the modes of propagation of fresh-water fishes, by S. Nikitin (in French). M. Nikitin objects to the too hasty generalizations sometimes arrived at by men of science (especially with regard to Central Asia) as to the former communication between distant fluviatile basins and lakes which now have some species of fishes in common. He points out the possibility of the transport of the eggs of certain fishes by birds, and mentions the fact of young pikes, from six to ten centimetres long, being found in small temporary ponds on the banks of the Moskva river, where they could by no means have migrated themselves. Further inquiry is asked for.—The transport of electrical energy, by J. Weinberg (in German).—On the nesting of *Podoces Panderi*, by N. Zarudny.—The Amphibian fauna of Europe: the *Anura* (continued), by Dr. J. Bedriaga. The genera *Hyla*, *Pelobatus*, *Pelodytes*, *Discoglossus*, *Bombinatur*, and *Alytes*, are considered, and the author describes two new varieties of *Hyla arborea* under the names of var. *orientalis* and var. *Molleri*.—On the influence of weather upon plants and animals, by Alex. Becker (in German).

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 8.—"Experiments on Vapour-Density." By E. P. Perman, B.Sc. Communicated by Prof. Ramsay, F.R.S.

Vapour-density of Bromine.—This work was undertaken in order to see if the results of Prof. J. J. Thomson's experiments could be verified; these appeared to show that bromine vapour dissociated on continued heating at a low pressure, and a comparatively low temperature. The method used was a modification of the Dumas method, by which a series of vapour-density determinations were made at different pressures, with the same identical material. The chief conclusions arrived at are (1) that no dissociation takes place at temperatures as high as 280°, and pressures as low as 20 mm., even on continued heating; (2) that bromine vapour has no tendency to form molecules with more than two atoms, on approaching the liquid state.

Vapour-density of Iodine.—The density of saturated iodine vapour was determined by an adaptation of Kundt's method of determining the velocity of sound in gases. The mean result was 126·9, showing that liquid iodine has the formula I_2.

Induction Spark through Iodine Vapour.—The same apparatus was used as in finding the vapour-density of iodine. No alteration of the wave-length in the iodine vapour (as indicated by the heaps of finely-divided silica on the lower part of the tube) occurred on passing a series of sparks, and then causing the glass piston to vibrate. Sparking does not appear, therefore, to produce permanent dissociation of iodine vapour, notwithstanding the results pointing to a contrary conclusion, obtained by Prof. Thomson. Neither bromine nor iodine vapour, when saturated, threw the silica into heaps; it appears that sound-waves cannot be propagated in a saturated vapour, for condensation will be produced either by the waves of compression or those of expansion (according to the nature of the vapour, and its temperature) and the rates of propagation of the two sets of waves will therefore be different.

Vapour-densities of Sulphuric Anhydride, and Aqueous Hydrochloric Acid.—These were determined by the same method as the vapour-density of bromine. The vapour-density of sulphuric anhydride indicated a formula SO_3, and that of aqueous hydrochloric acid showed that it is a mixture of molecules HCl and H_2O, and not a compound. In all these experiments the quantity of substance in the globe was not found by weighing, but by estimating it volumetrically, portions being drawn off and absorbed in a suitable liquid. The globe was heated by means of a vapour-jacket; the vapours used were those of alcohol, chlorobenzene, bromobenzene, and bromonaphthalene.

The author is greatly indebted to Prof. Ramsay for constant advice and assistance in carrying out the work.

May 22.—"The Chemical Products of the Growth of *Bacillus anthracis* and their Physiological Action." By Sidney Martin, M.D., Pathologist to the Middlesex Hospital. Communicated by Dr. Klein, F.R.S.

The bacilli were grown in a solution of pure alkali-albumin (made from serum-proteids) and of mineral salts of the composition of the salts of the serum.

The cultivation of the bacilli was continued for ten to fifteen days, and the organisms removed by filtering through Chamberlain's filter. The filtrate contained the products of the bacterial growth, viz.:—

(1) *Proto-albumose* and *deutero-albumose*, and a *trace of peptone*: all with the same chemical reactions as the similar bodies formed in peptic digestion.

(2) *An alkaloid.*

(3) Small quantities of *leucin* and *tyrosin*.

The chief characteristic of the anthrax proto- and deutero-albumose is their strong alkalinity in solution—an alkalinity not removed by absolute alcohol, by benzene, chloroform, or ether, or by prolonged dialysis. Acid-alcohol dissolves from the alkaline albumoses a trace of a poisonous body, but this is not in proportion to the toxicity of the albumoses. The albumoses are precipitated in an alkaline condition by saturation with NaCl (proto-albumose) or $(NH_4)_2SO_4$. The alkaloid is soluble in absolute alcohol, amyl alcohol, and in water; insoluble in benzene, chloroform, and ether. It is strongly alkaline in solution, and a powerful base, readily forming salts with acids. The sulphate crystallizes in small needles or prisms; the oxalate in long, branching needles or flat plates. From the salts the alkaloid is easily regained. In solution, the alkaloid is precipitated by phosphotungstic, phosphomolybdic, and phosphoantimonic acids and platinic chloride, but not by potassio-mercuric iodide. It is slightly volatile, and, when kept exposed to the air, it becomes acid, and loses, to a great extent, its poisonous properties.

Physiological Action.

(1) The mixture of anthrax proto- and deutero-albumose is poisonous. In small doses it produces in mice a local subcutaneous œdema, with some sluggishness, ending in recovery. Larger doses produce a greater œdema with more signs of illness, sluggishness leading to prolonged stupor, coma, and death in twenty-four hours or longer. A fatal dose for a mouse of 22 grams weight is 0·3 gram (subcutaneously injected). In some cases the spleen is enlarged: no organisms being present, as shown by gelatine tube cultivations. Boiling for a short time diminishes the toxicity of the proteid, but does not completely destroy it, and death may result from the boiled albumoses.

(2) The *anthrax alkaloid* produces symptoms and lesions similar to the albumoses, but much more rapidly and severely. The animal becomes ill directly after the injection, gradually becomes more and more sluggish, and dies in coma, or, if a non-lethal dose be given, it recovers from the state of stupor gradually. After death, enormous local subcutaneous œdema is found, with congestion and sometimes thrombosis of the small veins. Peritoneal effusion is occasionally present, and the spleen is usually enlarged, dark, and congested, or simply congested without being greatly enlarged. The fatal dose for a mouse weighing 22 grams is between 0·1 and 0·15 gram, death occurring in two to three hours.

The anthrax bacillus in digesting the alkali-albumin forms (1) proto-albumose, (2) deutero-albumose, (3) an alkaloid. The alkalinity of the albumoses may explain their toxic properties, being due to the fact that the alkaloid is in a "nascent" condition in the albumose molecule. The bacillus forms the alkaloid from the albumose, and it is possible that the living tissues have a similar action when the albumose is introduced into a living animal.

Entomological Society, May 7.—Captain Henry J. Elwes, Vice-President, in the chair.—Mr. H. Goss, the Secretary, read a letter from the Vicar of Arundel, asking for advice as to the course to be taken to get rid of the larvæ of a beetle which were destroying the beams of the parish church. Mr. C. O. Waterhouse said he had already been consulted on the question, and had advised that the beams should be soaked with paraffin oil.—Dr. Sharp exhibited specimens of *Caryoborus lacerdæ*, a species of *Bruchidæ*, and the nuts from which they had been reared. He stated that these nuts had been sent him from Bahia by the late Señor Lacerda, about six years ago, and that one of the beetles had recently emerged, after the nuts had been in this country for five years. Dr. Sharp also exhibited several specimens of Diptera collected by Mr. Herbert Smith in St. Vincent, and read a letter from him to Mr. Godman on the subject of the vast number of species of this order which he had recently collected in that island. Mr. McLachlan, F.R.S., Dr. Mason, Mr. Waterhouse, and Captain Elwes took part in the discussion which ensued.—Mr. R. F. Lewis, on behalf of Mr. W. M. Maskell, of Wellington, New Zealand, exhibited and read notes on about twenty-five species of *Coccidæ* from that colony. He also exhibited some specimens of the larvæ and imagos of *Icerya Purchasi*, Maskell, obtained from Natal, where the species had proved very destructive to orange, lemon, and other fruit-trees. He also showed specimens of the larvæ of an allied species from Natal, originally assigned by Mr. Douglas to the genus *Ortonia*, but which Mr. Maskell was inclined to regard as a new species of *Icerya*. Mr. McLachlan and the Chairman commented on the interesting nature of the exhibition, and the importance of a knowledge of the parasites of injurious insects, in connection with which special mention was made of the researches and discoveries of Prof. Riley.—The Secretary exhibited, on behalf of Mr. T. D. A. Cockerell, of Colorado, a large collection of insect-galls, and read a letter from Mr. Cockerell on the subject. Dr. Mason said he should be happy to take charge of these galls, with a view of rearing the insects and reporting the results.—Mr. W. H. Bates, F.R.S., communicated a paper entitled, "On New Species of *Cicindelidæ*."

Royal Meteorological Society, May 21.—Mr. Baldwin Latham, President, in the chair.—The following papers were read:—Rainfall of the globe, by Mr. W. B. Tripp. This was a comparative chronological account of some of the principal rainfall records. The earliest record is that of Paris, which commenced in 1689. The English records began in 1726. The rainfall observations in the southern hemisphere do not extend over a very long period; at Adelaide they were commenced in 1839, but they do not go back further than 1866 for New Zealand. The greatest fall in any particular year at the stations given by the author was 160·9 inches at St. Bernard in 1839, and the least 3 inches at Sandiego in California in 1863. By combining the stations in the northern and southern hemispheres the author finds that in recent times the years with the highest average rainfall were 1878, 1879, and 1883, and the years with the lowest average were 1854 and 1861.—Mutual influence of two pressure plates upon each other, and comparison of the pressures upon small and large plates, by Mr. W. H. Dines.—On the variations of pressure caused by the wind blowing across the mouth of a tube, by Mr. W. H. Dines. In these two papers the author gives the results of some experiments on wind pressure which he has made mostly on a whirling machine at Hersham, Surrey. From these experiments it seems probable that a decrease of pressure per square foot with an increase of size of plate may be taken as a general rule.

Geological Society, May 14.—Dr. A. Geikie, F.R.S., President, in the chair.—The following communications were read:—The so-called Upper Lias Clay of Down Cliffs, by S. S. Buckman. The blue clay of Down Cliff, Dorset, which has been referred to the Upper Lias, has yielded Ammonites of the genus *Dumortieria* to the author, notably *D. radians*. This blue clay is *below* the Yeovil Sands; but the position of *D. radians* in the Cotteswolds is in the limestone *above* the Cotteswold Sands, which has been placed in the Inferior Oolite series. The author, by combining the Down Cliffs and Chideock Hill sections, obtains a sequence of beds from the Middle Lias to the top beds of the Inferior Oolite, including the zones of *spinatum*, *commune*, and *falciferum*, *jurense*, *opalinum*, *Murchisonæ*, *concavum*, and *Parkinsoni*. The genus *Dumortieria* binds the *opalinum* and *jurense* zones together; while at Symondsbury Hill the author has found *Ludwigia Murchisonæ* and *Lioceras opalinum* in the same bed, which renders it difficult to draw a line of demarcation between Lias and Oolite at the top of the *opalinum* zone. The facts adduced in the paper furnish additional evidence of the untrustworthiness of a grouping which depends upon lithological appearances, and it was because no satisfactory line could be drawn between Lias and Oolite that the author, in a previous paper, supported the continental plan of grouping Upper Lias and part of the Inferior Oolite under the term Toarcian upon palæontological grounds. In the present paper he furnishes further statements in support of this view. After the reading of this paper some remarks were offered by Mr. H. B. Woodward, Mr. Hudleston, and the President.—On some new mammals from the Red and Norwich Crags, by E. T. Newton.—On burrows and tracks of Invertebrate animals in Palæozoic Rocks, and other markings, by Sir J. William Dawson, F.R.S.—Contact-alteration at New Galloway, by Miss M. I. Gardiner. Communicated by J. J. H. Teal.

Zoological Society, May 20.—Prof. W. H. Flower, F.R.S., President, in the chair.—Mr. Gambier Bolton exhibited a series of photographs, principally of animals living at the Society's Gardens and in Mr. Walter Rothschild's menagerie.—Prof. Flower exhibited a photograph of a nest of a Hornbill (*Toccus melanoleucos*), taken from a specimen in the Albany Museum, Grahamstown, in which the female was shown "walled in."—A communication was read from Sir Edward Newton relating to the reported discovery of Dodo's bones in Mauritius in 1885, by the late Mr. Caldwell. It appeared that there had been some error in the matter, and that the bones discovered were not those of the Dodo.—Mr. Sclater, F.R.S., pointed out the characters of a new Toucan of the genus *Pteroglossus* from the Amazons, proposed to be called *P. didymus*.—Mr. R. Lydekker read a paper describing some bird-remains from the cavern-deposits of Malta. These remains indicated a Vulture larger than any existing species, which, from the characters of the cervical vertebræ, he referred to the genus *Gyps*, under the name of *G. melitensis*. They also comprised some bones of a crane, of the size of *Grus antigone*, for which the name *Grus melitensis* was proposed.—Dr. Hans Gadow gave an account of some cases of the modification of certain organs in Mammals and Birds which seemed to be illustrations of the inheritance of acquired characters.

EDINBURGH.

Royal Society, May 19.—After the reading of some obituary notices, Prof. Crum Brown read a paper written by himself and Dr. J. Walker on the synthesis of sebacic acid.—Prof. Tait communicated a note on some remarkable quaternion formulæ.—Dr. Alexander Bruce read a paper on the roots of the auditory nerve and their connections.

PARIS.

Academy of Sciences, May 19.—M. Hermite in the chair.—Experiments on the deformations experienced by a spheroidal envelope subjected to pressure; possible applications to the terrestrial globe, by M. Daubrée. From the experiments described in this and in a previous communication, it appears that the author has been able to produce in various spheroids configurations like those exhibited by the earth's crust. He finds that the southern parts of the three continental masses are not deviated towards the east because of the influence of the earth's rotation, but by the effect of simple torsion in a spheroidal heterogeneous envelope subjected to contraction, similar reasoning is extended to explain characteristic canals of Mars.—New method of calculation for the interpolation and correction of meteorological observations, by M. Marc Dechevrens. The interpolation formula generally used in researches into the laws of variations of meteorological phenomena, and due either to Bessel or Fourier, is long and tedious. From considerable use of this method the author has found that it may be simplified, and in the memoir presented shows how arithmetic—multiplication and addition—may replace trigonometry, angles and logarithms.—Observations of Brooks's comet (*a* 1890) made with the great equatorial of Bordeaux, by MM. Rayet and Courty. Measures of position are given. A photograph of the comet was obtained on May 15 with an exposure of one hour. It appears on the negative as a disk having a sensible diameter, surrounded by nebulosity, and connected with a head about 2′ long.—On the asymptotic value of the polynomials of Legendre, by M. Stieltjes.—On the determination of a point, by M. Hatt.—On the isomeric states of chromic bromide, by M. A. Recoura. The author shows that, just as in the case of the chloride, two sesquibromides may be prepared which on treatment with alkaline hydrates both yield the chromic hydrate belonging to the series of violet chromic salts. He gives a method for the preparation of the green salt in crystals of the composition Cr_2Br_6, $12H_2O$; these crystals are stable when solid, but the salt changes into the violet modification rapidly when in solution. The heat of combination of the green salt (in solution) with NaOH is given as 33·1 cal., whereas that of the violet salt is but 21·6 cal.; during the transformation from the green to the violet modification 11·5 cal. are disengaged.—On the existence of a crystallized hydrated ferric oxychloride, and its transformation into a dimorphous variety of göthite, by M. G. Rousseau. By prolonged heating of a concentrated solution of ferric chloride, in the presence of a little calcium or magnesium carbonate, in a sealed tube, crystals are obtained of the formula Fe_2Cl_6, $2Fe_2O_3$, $3H_2O$. In boiling water a reaction occurs which may be expressed thus—

$$Fe_2Cl_6,\ 2Fe_2O_3,\ 3H_2O + nH_2O = 3(Fe_2O_3,\ H_2O) + 6HCl + (n-3)H_2O\ ;$$

the body Fe_2O_3, H_2O possessing the composition of göthite and only differing from the latter in some of its physical properties.—On some new double chromates, by MM. M. Lachaud and C. Lepierre. Double chromates of lead with potassium, lithium, and sodium are described, similar products being obtained in the case of each of the alkaline metals. Yellow bodies of the composition $PbCrO_4$, M_2CrO_4, and orange compounds of the formula $PbCrO_4$, M_2CrO_4, $2PbO$, have been prepared.—On the crystallization of alumina and some other oxides in hydrochloric acid gas, by MM. P. Hautefeuille and A. Perrey.—Note on the *bouquet* of wines and brandies, by M. A. Rommier. It is shown that different ferments produce from the same grapes wine of different flavour, and that solutions of sugar fermented by means of the natural ferments obtained from different districts yield on distillation alcohols possessing different odours; and it is suggested that the characteristic bouquet is due to a compound ether formed from the alcohol combined with a fatty acid produced from the fat which each ferment manufactures from the sugar for its own use.—On the clinical characters of true intermittent fevers; the law and preventive treatment of relapses, by M. Alcide Treille. The author gives his method of treatment by sulphate of quinine, which he has used in fever cases in Algiers for about twenty years.

BERLIN.

Physiological Society, May 9.—Prof. du Bois Reymond, President, in the chair.—Dr. Löhers spoke on the effect of inhalations of bromethyl and nitrous oxide on the circulation and respiration, deduced from experiments made with a view to obtaining a physiological basis for the use of these anæsthetics. Bromethyl slows the respiration, leaving the inspirations unaltered, but rendering the expirations weaker and weaker, until they disappear entirely; at an early stage of its action respiration becomes again normal if the animal is supplied with fresh air, but later on this is not the case, and death ensues by the action of the drug on the heart. The effect on the circulation is to quicken it at once; the blood-pressure falls, the pulse becomes arhythmic, and finally ceases; the left side of the heart is now found to be empty, the right gorged with blood; it appears that bromethyl affects the two halves of the heart differently, and thus probably gives rise to the asymmetry of the pulse. When the vagi are cut the effect of the drug on both circulation and respiration is longer in making its appearance. Nitrous oxide has a more powerful action on respiration, the inspirations diminishing rapidly and ceasing suddenly. Normal respiration may be restored by fresh air if the action of the drug has not been too prolonged. The effect on the heart is to increase the blood-pressure. It appears on the whole that bromethyl must be more cautiously employed than nitrous oxide as a narcotic.—Dr. Blaschko made a further communication on the architecture of the skin.—Dr. Löwy gave an account of experiments upon the irritability of the respiratory centre. The experiments were conducted on human beings in such a way as to discriminate between the effects of varying irritability of the centre and varying strength of stimulus applied to it in determining variations in the magnitude of the respiratory movements. The stimulus used was carbonic acid gas mixed in definite proportions with the inspired air. It appeared that dyspnœa did not supervene with less than 6 per cent. of CO_2 in the air; and that in the various states of sleep, whether natural or resulting from narcotics, and after the administering of alcohol and camphor, equal increments of CO_2 lead in all cases to an equal increase of the respiratory movements; hence in all these conditions the irritability of the centre must have been the same. Morphia, on the other hand, lessens the irritability.—Prof. Gad stated that he had some years ago observed a capillary network among the cells of the epithelium which covers the floor of the fourth ventricle, and that Retzius had observed a similar case in the internal ear. It now appears that the occurrence of blood-vessels between the cells of an epithelium is extremely rare, and he therefore urged morphologists to keep a look-out for and to investigate any cases which they may observe.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

A Treatise on Diseases of the Nose: Dr. G. Macdonald (A. P. Watt).—The Canary Book, Part 1: R. L. Wallace (Gill).—British Cage Birds, Part 1: R. L. Wallace (Gill).—Plant Organization, 2nd edition: Dr. R. H. Ward (Arnold).—Fifth and Sixth Annual Reports of the Bureau of Ethnology: J. W. Powell (Washington).—British Birds, Key to the present Classification: W. H. Wintringham (Grimsby News Company).—Traité Encyclopédique de Photographie, doux. fasc. (Paris, Gauthier-Villars).—Science Applied to Work: J. A. Bower (Cassell).—The Golden Bough: J. G. Frazer (Macmillan).—The Advancement of Science: E. Ray Lankester (Macmillan).—Mungo Park and the Niger: J. Thomson (Philip).—Epitomes of Three Sciences:—Comparative Philology, Psychology, and Old Testament History: H. Oldenberg, J. Jastrow, and C. H. Cornill (Chicago, Open Court Publishing Company).—The Birds of Essex: M. Christy (Simpkin).—Meteorology of Sheffield, 1887–89: E. Howarth.—Earthworks of Ohio: C. Thomas (Washington).—Textile Fabrics of Ancient Peru: W. H. Holmes (Washington).—The Problem of the Ohio Mounds: C. Thomas (Washington).—A Summer School of Science: Prof. P. Geddes (Edinburgh, Thin).—The Pterylography of Birds' Wings: W. P. Pycraft (Leicester).

CONTENTS.

PAGE

The Laboratory of the Royal College of Physicians, Edinburgh. By J. G. Adami 97
Abstract Mechanics. By A. G. G. 98
Our Book Shelf:—
Owen: "A Manual of Anatomy for Senior Students" 98
Thornton: "Advanced Physiography" 99
Hale: "An International Idiom" 99
Irvine: "A Class-book of Geography" 99
Letters to the Editor:—
Idiocyclophanous Crystals of Calcite. (*Illustrated.*)—**H. G. Madan** 99
Testing for Colour-blindness.—**Prof. Oliver J. Lodge, F.R.S.; E. H.; Rev. F. M. Millard** . 100
Red Spot on Jupiter.—**W. F. Denning** 100
Coral Reefs, Fossil and Recent.—**Dr. R. von Lendenfeld** 100
Swallows at Sea.—**Lieutenant Herbert E. Purey-Cust, R.N.** 100
The Corolla in Flower-Fertilization.—**Dr. John Harker** 100
Popocatapetl.—**Edmund J. de Valois** 101
Chemical Changes in Rocks under Mechanical Stresses. (*Illustrated.*) **By Prof. J. W. Judd, F.R.S.** 101
The Uniform Penny Post 106
Pendulum Electrometer. (*Illustrated.*) 107
Notes 107
Our Astronomical Column:—
Objects for the Spectroscope.—**A. Fowler** 111
The Spectrum of Comet Brooks (*a* 1890).—**A. Fowler** 112
New Variable Star in Cygnus 112
Paris Observatory 112
On the Parallax of Double Stars 112
Turin Observatory 112
A Contribution to the Etiology of Diphtheria. By Dr. E. Klein, F.R.S. 113
Some Notes from South America. By W. Larden . 115
On the Properties of Liquefied Gases 116
Notes on Indian Insect Pests. By A. E. S. 116
University and Educational Intelligence 116
Scientific Serials 117
Societies and Academies 118
Books, Pamphlets, and Serials Received 120